

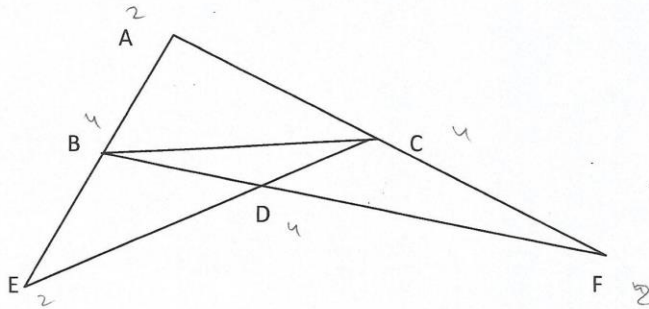
University of Bahrain  
IT College of Information Technology  
Department of computer science  
ITCS253 Discrete Structures II  
1<sup>st</sup> semester 2012-2013  
Quiz # 1

10/10

ID:

Name:

Q1. Consider the following graph



a) Is the graph complete? Why?

2 No, there is no edge between A and D.

b) Is the graph bipartite? Why?

2 No, because there is triangle ABC

c) Does the graph contain Euler circuit? Why?

yes, all vertices have even degree and the graph is connected.

d) Find the degrees of vertices E and D. Find a simple path of length 4 from A to F.

$\deg(E) = 2$ ,  $\deg(D) = 4$

2 path of length 4 from A to F: A C B D F

e) Write V, E and edge-point function.

$V = \{A, B, C, D, E, F\}$

$E = \{\{A, B\}, \{A, C\}, \{B, C\}, \{B, D\}, \{C, D\}, \{C, F\}, \{B, E\}, \{D, F\}, \{D, E\}\}$



University of Bahrain  
College of Information Technology  
Department of Computer Science  
ITCS 253 Discrete Structures II  
1<sup>st</sup> Semester 2012-2013  
(Section 1)  
Quiz #2

10/10

ID:

Name:

**Q1. (10 marks)** The adjacency matrix  $A$  of a graph is given below.

	a	b	c	d	e
a	0	0	1	1	0
b	0	0	1	1	0
c	1	1	0	1	0
d	1	1	1	0	1
e	0	0	0	1	1

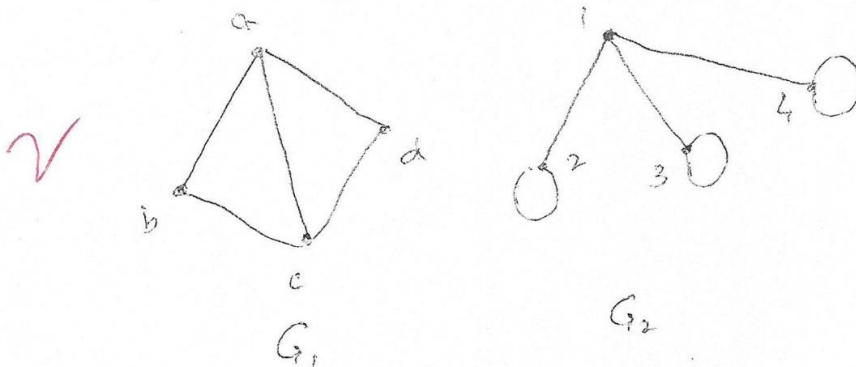
Without drawing the graph,

- ✓ a) Is the graph simple? Why. *No, vertex e has a loop (e,e)*  
 ✓ b) Is the graph undirected? Why. *Yes, the matrix is symmetric*  
 c) Find the degree of each vertex.  
 d) Find the number of edges in the graph.

✓ c)  $\deg(a)=2$     $\deg(b)=2$     $\deg(c)=3$     $\deg(d)=4$     $\deg(e)=3$

d) ✓ 7 edges

**Q2.** Are the following pair of graphs isomorphic? Why



No, because number of edges are not equal  
 $|E_1| = 5 \neq |E_2| = 6$

University of Bahrain  
College of Information Technology  
Department of Computer Science  
ITCS 253 Discrete Structures II  
1<sup>st</sup> Semester 2012-2013  
Quiz #3

10

ID:

Name:

**Q1. (7.5marks)** For the following statements about a tree  $T$ , mention which of them are true and which of them are false. Justify.

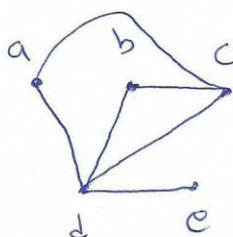
- a) There are many paths between any two vertices of a tree. F ✓
- b) A tree is connected and removal of a single edge does not disconnect it. F ✓
- c) Find the number of edges in tree with  $n$  number of vertices. F ✓
- d) There are  $m^h$  leaves in a complete full  $m$ -ary tree of height  $h$ . T ✓
- e) Number of leaf nodes in a completely filled  $m$ -array tree equals  $m^h$ . T ✓

7.5

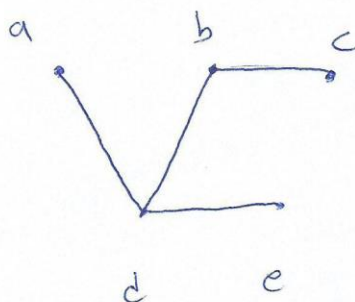
a) False, because if there are many paths between any two vertices, the graph may have cycles

b) False, if removal of a single edge does not disconnect a tree, then that edge make a cycle  $\Rightarrow$  the graph is not a tree (contradiction)

**Q2. (2.5 marks)** Draw a spanning trees of the graph the adjacency matrix  $A$  of which is given below.



	a	b	c	d	e
a	0	0	1	1	0
b	0	0	1	1	0
c	1	1	0	1	0
d	1	1	1	0	1
e	0	0	0	1	0



2.5



University of Bahrain  
College of Information Technology  
Department of Computer Science  
ITCS 253 Discrete Structures II  
1<sup>st</sup> Semester 2012-2013  
Quiz #5

6

ID:

Name:

Q1. (5 marks) Show that

$$C(n+1, r) = C(n, r-1) + C(n, r)$$

R.H.S:

$$\frac{n!}{(n-r+1)!(r-1)!} + \frac{n!}{(n-r)!r!}$$

$$\frac{n!}{(n-r+1)!(r-1)r!} + \frac{n!}{(n-r)!r!}$$

R.H.S:

$$\frac{(n+1)!}{(n+1-r)!r!}$$

Q2. (5 marks) Find number of words of length 3 using letters A, B, C and D in each of the following cases

- Repetition is allowed.
- Repetition is not allowed.

a)

$$\text{no. of words} = 4^3 = 4 \times 4 \times 4 = 16 \times 4 = 64$$

b)

$$\text{no. of words} = 4 \times 3 \times 2 = 12 \times 2 = 24$$